

QOS BASED ANALYSIS OF MDART USING AODV AND AOMDV

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ABSTRACT

Routing protocols play a vital role in transmission of data across the network. The two major classifications of routing protocols are unipath and multipath. In this paper, we propose a Distributed Hash Table (DHT)-based multi-path routing protocol for scalable ad hoc networks and evaluated the performance of a widely used on-demand unipath routing protocol called AODV and multipath routing protocol AOMDV and MDART. The results show that M-DART performs the best or at least comparable with respect to AOMDV and AODV. Moreover, unlike these protocols, it is able to assure satisfactory performances for large networks by reducing the packet loss by up to 75%. These protocols have been selected due to their edge over other protocols in various aspects, such as reducing delay, routing load etc. The evaluation of all the protocols is carried out in terms of different scenarios using NS2.

KEYWORDS: MANET, AOMDV, MDART, AODV, CBR, NS2

INTRODUCTION

To study and analyze various Routing Protocols named AODV and AOMDV and MDART (*Multi-Path Dynamic Addressing Routing*) in ns-2. To analyze the improved tolerance of these Protocols against mobility as well as power failures. To perform comparative analysis for performance of Routing protocols based on Energy consumption, PDR, Throughput and Jitter. The most popular on-demand routing protocol, Adhoc On-demand Multipath Distance Vector (AOMDV) routing protocol [1] is an improvement of Ad-hoc On-demand Routing Protocol (AODV). AOMDV discovers multiple paths between a source and destination to provide efficient fault tolerance by providing quicker and more efficient recovery from route failures in a dynamic network. As AOMDV discovers multiple paths in a single route discovery attempt, new route needs to be discovered only when all paths fail. This reduces not merely the route discovery latency but the routing overheads also. AODV is a reactive and a single path routing protocol. It allows users to find and maintain routes to other users in the network whenever such routes are needed. The adhoc on demand distance vector routing protocol provides unicast, broadcast and multicast communications in adhoc networks. AODV initiates route discovery whenever a route is needed by the source node or whenever a node wishes to join a multicast group. Routes are maintained as long as they are needed by the source node or as long as the multicast group exists and routes are always loop free through the use of sequence numbers [2]. A multipath enhancement to DART [3] was proposed in [4] called Augmented Tree based Routing (ATR), but in ATR the DHT system is replaced by a global lookup table which is available to all the nodes, which results in a great impact on the address discovery, which is a key process of the whole routing protocol. Among the DHT based Routing Protocols, M-DART is an enhancement of shortest path routing protocol known as Dynamic Address Routing (DART) [3]. M-DART discovers and stores multiple paths to the destination in the routing table. The remainder of this paper is organized as follows. Section II discusses related work of different protocols. Section III discusses an overview of dynamic addressing and DHT of routing protocols. Section IV and V discuss proposed scheme and the simulation results of the two routing protocols with different parameters. Finally, we summarize and conclude our paper in section VI.

RELATED WORK

- **Xu Yi, Cui Mei, Yang Wei, Xan Yin, “A Node-Disjoint Multipath Routing in Mobile Ad hoc Networks”, 2011 [5]**

In this paper author discussed the Multipath routing problem of MANETs with multiple QoS constraints, such as delay, bandwidth and reliability metrics, and describes a network model for researching the routing problem. Author also presented a Node-Disjoint Multipath Routing Protocol (NDMRP) with multiple QoS constraints.

- **Fubao Yang, Baolin Sun, “Ad hoc On-Demand Distance Vector Multipath Routing Protocol with Path Selection Entropy”, 2011[6]**

This paper proposed a Ad hoc On-demand Distance Vector Multipath Routing Protocol with Path Selection Entropy (AODVM-PSE). It is an extension to AODVM. AODVM-PSE assigns the construction of multiple paths to the destination node and makes it algorithmically simple, resulting in the improved performance of packet delivery, average end-to-end delay and control packets ratio incurred at intermediate nodes.

- **Phu Hung Le, Guy Pujolle, Thi-Mai-Trang Nguyen, “An Interference-Aware Multi-Path Routing Protocol for Mobile Ad hoc Network”, 2011[7]**

In this paper, author proposed a node-disjoint Interference-Aware Multi-Path OLSR routing protocol (IA-MPOLSR) which is based on the Optimized Link State routing protocol (OLSR) for MANET to increase the stability and reliability of the network.

- **May ZinOo, Mazliza Othman , “Performance Comparisons of AOMDV and OLSR Routing Protocols for Mobile Ad Hoc Network”, 2010[8]**

In this paper, author analyzed the performance differences of Ad hoc On-demand Multi-path Distance Vector (AOMDV) and Optimized Link State Routing (OLSR) routing protocols.

- **Yanbin Yang, Hongbin Chen, “An Improved AODV Routing Protocol for MANETs”, 2009[9]**

In this paper author proposed a hybrid routing protocol for mobile ad hoc networks (MANETs) called Improved Ad hoc On-demand Distance Vector (IAODV). It merges the AODV routing protocol with multipath and path accumulation (PA).

- **EhsanKhosrowshahi Asly , MortezaDamanafshany,MaghsoudAbbaspour, MajidNoorhosseiniz, Kamran Shekoufandehy, “EMP-DSR: An Enhanced Multi-Path Dynamic Source Routing Algorithm for MANETs Based on Ant Colony Optimization”, 2009[10]**

In this paper author proposed an Enhanced Multi-Path Dynamic Source Routing Algorithm (EMP-DSR) which is an enhanced version of MP-DSR. The proposed method uses an ant-colony optimization method to provide global information.

AN OVERVIEW OF DYNAMIC ADDRESSING AND DHT IN THE TERMS OF ROUTING PROTOCOLS

Dynamic Addressing [11] is used to separates the address of routing protocols and the identity of a node. The address of node is dynamic which changes the movement of node and location of nodes.

MDART

The multi-path dynamic Address routing (MDART) is proposed by **J. Eriksson, M. Faloutsos and S. Krishnamurthy** which is extends version of DART which is a shortest-path routing protocol to discover multiple routes between the source and the destination. M-DART is improves the tolerance of a tree-based address space and channel impairments. M-DART containing two novel aspects, first, the Redundant Routes are guaranteed the communication-free and coordination-free which are be used to discover that any network does not require any additional communication or coordination overhead. Second, all the available redundant paths between source and destination do not contained limited number. The Multi-Path Dynamic Addressing Routing (M-DART) is a routing protocol for ad hoc networks are used for improves the performances of static topologies as well as route diversity.

Address Space

The address space of MDART can be represented as a binary tree of three levels. A binary tree contained in that way every vertex has zero or two children and all leaves are at the same level Figure 1. In the binary tree structure each leaf is containing with a network address, and the set of network addresses having inner vertex of level k which is called a level- k sub tree. For example, according to Figure 1, the vertex with the label 01z is a level-1 subtree and represents the leaves 010 and 011. Let us define level- k sibling of a leaf as the level- k subtree which shares the same parent with the level- k subtree the leaf belongs to. Therefore, each address has 1 siblings at all and each other address belongs to one and only one of these siblings. Referring to the previous example, the vertex with the label 1zz is the level-2 sibling of the address 000, and the address 100 belongs only to this sibling.

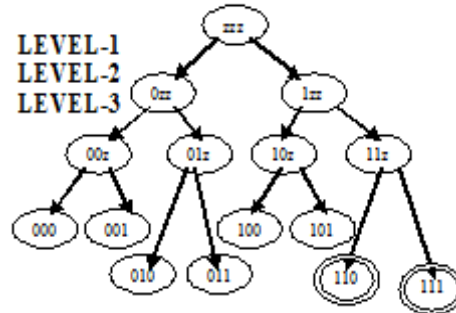


Figure 1

In Figure 2, the address space is represented as an overlay network built upon the underlying physical topology.

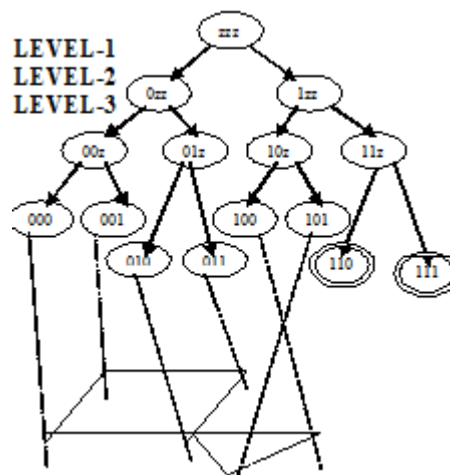


Figure 2: Relationship between the Address Space Overlay and the Physical Topology

Route Discovery and Packet Forwarding

Each node maintains a routing table in Figure 3 having one for each sibling and the k th section stores the path toward a node belonging to the level- k sibling. Every section stores five fields: the sibling ID, the next hop, the Route Cost, the network ID and the Route log. The table has three sections: the first stores the best route containing the node 001, the second toward a node containing to the sibling 01Z and the last toward nodes containing to the sibling 1ZZ.

Sibling ID	Next Hope	Route Cost	Network ID	Route Log
001	001	C(000,001)	Min ID (N) upto 000	001
01Z	010	C(000,010)	Min ID (N) upto 00ZZ	010
1ZZ	010	C(000,010) + min C(110,ZZ) upto 1ZZ	Min ID (N) upto 0ZZ	100

Figure 3: MDART Routing Table for Node 000

Each entry is composed by four fields which is used for periodic routing updates for exchanging neighboring nodes and for update routing entries should be stored:

- The sibling id
- The cost
- The network id
- The route log

AOMDV

AOMDV [12], [11] is a multi-path routing protocol. It is an extension to AODV and also provides two main services i.e. route discovery and maintenance. Unlike AODV, every RREP is being considered by the source node and thus multiple paths can be discovered in one route discovery. Being the hop-by-hop routing protocol, the intermediate node can maintain multiple path entries in their respective routing table. hop. To discover distinct paths, AOMDV suppresses duplicate route requests at intermediate nodes. Such suppression comes in two different variations, resulting in either node (illustrated in Figure 4 (a)) or link (illustrated in Figure 4(b)) disjoint. AOMDV can be configured to either discover the link (no common link between any given pair of nodes) or node (in addition to link disjoint, common intermediate nodes are also excluded between any given pair of nodes) disjoint paths. Disjoint alternate paths are a good choice than Overlapping alternate paths, as the probability of their interrelated and concurrent failure is smaller. Finding a disjoint path is quite straightforward in source routing but hop-by-hop routing i.e. AOMDV is considered more efficient in terms of creating less overhead Number of paths in any given source and destination is directly proportional to the number of nodes in entire network. AOMDV works more efficiently indense and heavy networks.

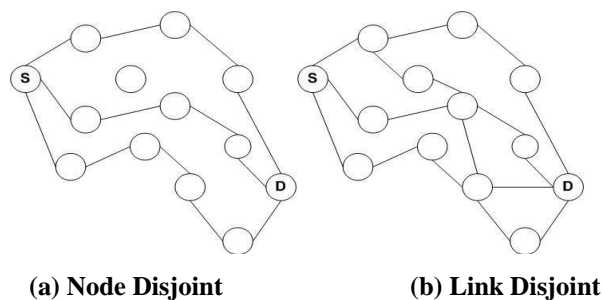


Figure 4: AOMDV Multi-Path

PROPOSED SCHEME

We proposed a new protocol to enhance the performance of MANETs which is based on new paradigm. We will implement a new DHT based multipath routing protocol in ns-2. Our main objective is to check its performance against scalability and power failures. In addition to this we will implement AODV and AOMDV and M-DART routing protocol in ns-2. AODV has single path reactive protocol of MANETs where as M-DART and AOMDV is multipath reactive protocol of MANETs. We give a contribution toward such an approach by focusing our attention on the problem of implementing a DHT-based routing protocol whose performance are competitive with those of other widely adopted protocols. The proposed protocol, namely the multipath dynamic address routing (M-DART), is based on prominent DHT-based shortest path routing protocol known as DART. M-DART extends the DART protocol to discover multiple routes between the source and destination. In this way, M-DART is able to improve the tolerance of tree based address space against mobility. Moreover, the multipath features also improve the overall performance. Here we compare two multipath routing protocols M-DART and AOMDV and one single path routing protocol AODV to analyze the tolerance against mobility as well as power failures and parameters such as PDR (packet delivery ratio), Average Throughput, Average Jitter, and Energy Consumption. There are many research papers on routing protocols in wireless sensor network and all are used for evaluating performance of different parameters in different scenario. Researchers specify the performance for different parameters and which one is best for the case of Wireless Sensor Network. In comparison of AODV, DSR and Hybrid the Average end-to-end delay of WBAODV is very high. While in comparison of DSR and WBAODV routing protocols, WBAODV performed better than DSR in terms of throughput. As compare to WBAODV and DSR, Hybrid protocol perform better which has high Throughput and less End To End delay and high pdf.

THE SIMULATION RESULTS

We will implement three protocols named MDART and DART (*Multi-Path Dynamic Addressing Routing*) in ns-2 and evaluate their performance w.r.t. PDR, throughput, jitter and Energy Consumption. We will perform comparative analysis of these protocols in different mobility scenarios.

Performance Metrics to be Used

Average Throughput, Packet Delivery Ratio, Load, Residual Energy

Average Throughput

The throughput of M-DART is very slightly better than AOMDV and AODV they behaves like M-DART up to 100 nodes, but it starts to behave poorly beyond this since it works on On-Demand technology.

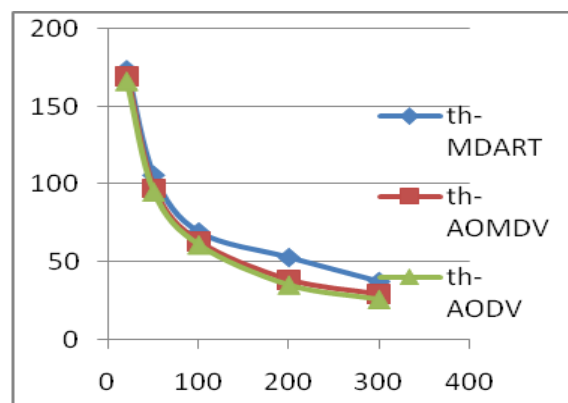


Figure 5: Throughput vs Number of Nodes

Packet Delivery Ratio (PDR)

It is used for select the best route, transmission rate or power. M-DART has better throughput than both AOMDV and AODV as the number of nodes increases.

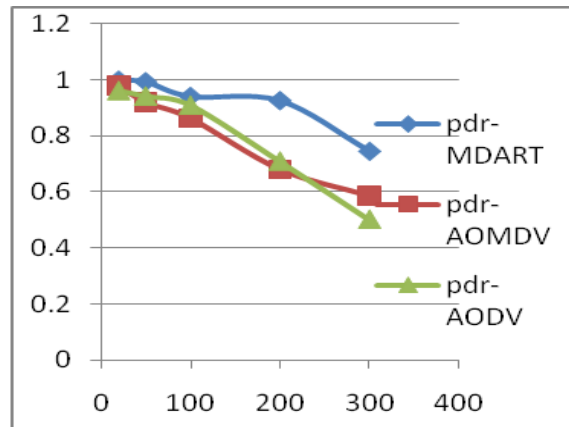


Figure 6

Traffic Load (pkts/sec)

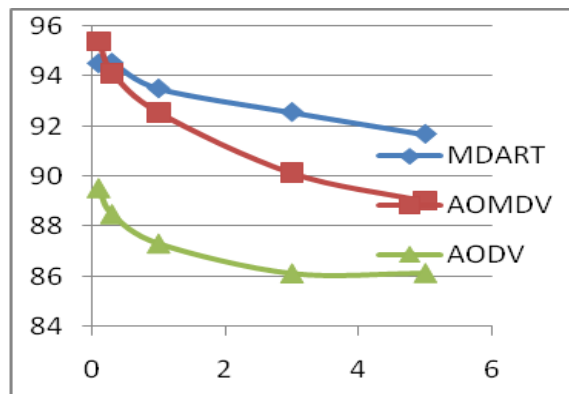


Figure 7

Residual Energy

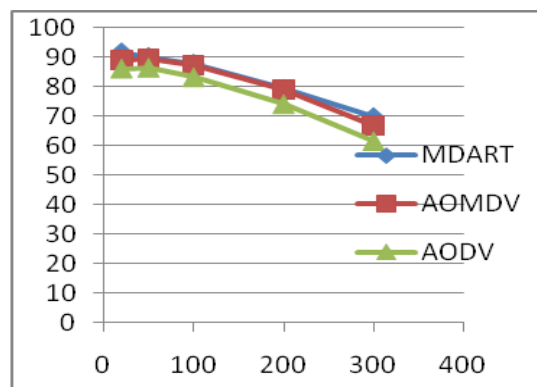


Figure 8

CONCLUSIONS

This paper proposes the M-DART protocol, AOMDV protocol and AODV protocol. M-DART is used for shortest-path routing protocol and it exploit all paths without introducing any communication or coordination overhead

with respect to the original protocol. Simulation results and performance comparisons with existing protocols substantiate the effectiveness of MDART for scalable networks with different workloads and environmental conditions in presence of moderate mobility. In particular, M-DART is able to perform best or comparable with the best protocol for each considered scenario. Several additional issues related to the design and evaluation of the M-DART protocol requires further investigation. First, the protocol can be improved by resorting to more effective multi-path schemes. Second, we need to validate the obtained results with experimental results, at least for the scenarios that do not involve large networks, and to carefully study the interaction between timeout settings and M-DART performances. Third, evaluating the performances of M-DART for P2P applications is another issue for future work. Finally, it will be useful to see if the opportunistic approach applied to the dynamic addressing can assure satisfactory performances in scenarios characterized by high mobility.

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AUTHOR'S DETAILS



Dr. Sandeep Singh Kang Working at CGC-College of Engg. Landran as HOD (CSE) Since Nov, 2007. 2013. He did his B.Tech from Punjab Technical University and M. Tech from Punjabi University Patiala. Recently he has completed his Ph.D in Computer Science & Engineering in the area of Wireless Networks. He has total of 10 years of Experience. He has Published 52 Research Papers in International/National Journals and Conferences and attended 12 workshops and FDP's for enhancement of his skills. He has published a BOOK Title: “**Integrated Approach to Network Security**”. Besides this, he has guided around 20 Students for PG Research Work and guiding 02 students for doctorate. His area of specialization is Security of Wireless Networks. He is the Life Member of Computer Society of India and Member Board of Studies (Computer Science), Punjab Technical University, Jalandhar.